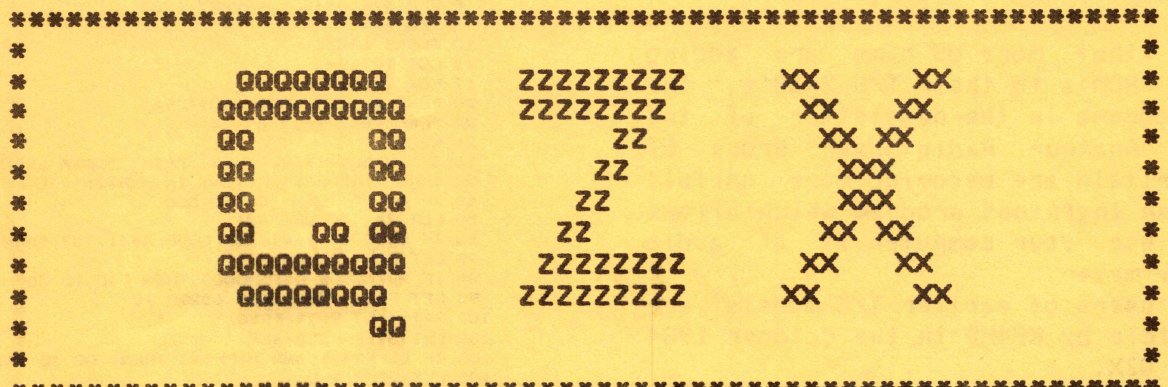

The Journal Covering Amateur Radio & Sinclair Computers
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88001

K5XY
Alex. F. Burr
Publisher

W4GHV/5
Bo Barry
Editor

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COMING UP

Hunter's Bank Switching Operating System (BSOS) for the ZX-81 & TS-1000. Note: HM6116LP-3 RAM chips for the Hunter expansion board are available from him for 3/$10.00. See his ads in QZX.

(See information in this issue)

EPROM Programmer..... $80.00
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Frequency counter & alignment aid (Spectrum) - Roger, G4IDE

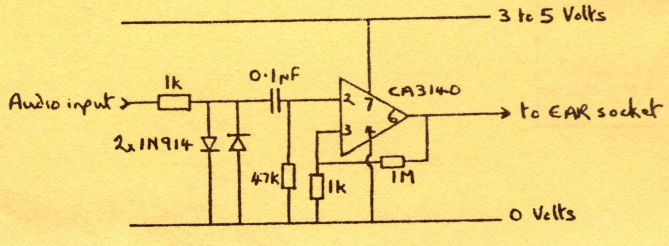
Now that more US hams are adding Spectrum ROM's to their T/S 2068's, the many programs in the newsletter of the Sinclair Anateur Radio User Group of Great Britain are becoming more useful. Here is an ingenious program which allows you to use your computer as an audio frequency meter.

For users of earlier T/S models see the article by KP4MD in the October 1984 issue of QZX.

This program displays the frequency of an audio tone input to the EAR socket of a 48K Spectrum. It uses the Spectrum interrupts as a timing reference & unless you have a poorly aligned Spectrum will give 0.1% or better accuracy!

The program also allows you to input a reference frequency & gives an audible indication of how near the reference frequency is to the input frequency. Be careful when entering the DATA statements - they must be EXACTLY as shown. A checksum is incorporated to trap errors.

When you RUN the program it will ask for a reference frequency; pressing ENTER at this point the program goes into counter-mode which displays the frequency input at the EAR socket, updated every second. If you input a reference frequency (line 30) then, besides displaying the frequency at the EAR socket, the program BEEPS according to the following rules. If your input is below reference frequency then it BEEPS a low tone; if above then it BEEPS a high tone. The length of the BEEP is proportional to the percentage error - if the error is 10% or greater then it's about 1 second; the BEEP gets shorter as the %-age error decreases. When the frequency is within +/- 1 Hz of the reference, then 5 short BEEPS of a middle tone are given. This sounds complicated, but in practice is very simple to use. The great benefit is that when aligning TU's, tone bursts, etc., you can keep your eyes on what you are doing & not have to keep looking at the screen. The Spectrum needs at least 500mv at the EAR socket for a reliable reading. The simple circuit below will amplify the input if needed.




```
  1 REM *** FREQUENCY COUNTER /
  2 REM *** ALIGNMENT AID.
  3 REM ***
  4 REM *** G4IDE JANUARY 1985
  5 REM ***
 10 CLEAR 65278
 15 LET TOTAL=0
 17 FOR I=0 TO 84
 20 READ A: LET TOTAL=TOTAL+A
 22 POKE (65279+I),A
 24 NEXT I
 26 IF TOTAL<>11122 THEN  PRINT "DATA ERROR!": STOP
 30 INPUT "REFERENCE TONE IN HERTZ:"; LINE A$
 40 IF A$="" THEN  GO TO 500
 50 FOR I=1 TO LEN A$
 60 IF CODE A$(I)<48 OR CODE A$(I)>57 THEN  GO TO 30
 70 LET REF=VAL A$
 80 IF REF<1 OR REF>30000 THEN  GO TO 30
 90 LET FREQ=INT ((USR 65298)/2)
100 PRINT AT 9,14;FREQ;"     "
102 LET DIFF=FREQ-REF
103 IF DIFF>=-1 AND DIFF<=1 THEN  GO TO 160
105 LET OFFSET=0
110 LET DIFF=10*DIFF/REF
120 IF DIFF<0 THEN  LET DIFF=-DIFF: LET OFFSET=-50
130 IF DIFF>1 THEN  LET DIFF=1
140 BEEP DIFF,40+OFFSET
150 GO TO 90
160 FOR I=1 TO 5
170 BEEP  1,20
180 NEXT I
190 GO TO 90
500 LET FREQ=INT ((USR 65298)/2)
510 PRINT AT 9,14;FREQ;"     "
520 GO TO 500
1000 DATA 1,255,243,245,58,82,255,60,254,50
1010 DATA 32,1,175,50,82,255,241,251,201,243
1020 DATA 1,0,0,175,50,83,255,50,82,255
1030 DATA 111,62,254,237,71,237,94,251,58,82
1040 DATA 255,95,58,82,255,187,40,250,95,219
1050 DATA 254,230,64,87,173,40,2,3,106,58
1060 DATA 82,255,187,40,7,62,1,50,83,255
1070 DATA 24,233,58,83,255,167,40,227,243,237
1080 DATA 86,251,201,0,0
```

Inexpensive Monitor
John Shelley - WA1IAO

There is a large group of home computers that use TV sets, or monitors based on TV sets, for video displays. This means that vertical resolution is limited to 525 lines by the nature of the standard EIA system. Horizontal & vertical resolution is further limited by the dot-clock crystal frequency of the computer and/or the IF bandpass of the TV set. Inserting the video only, from the computer, directly into the video amplifier of the TV should eliminate resolution loss inherent in RF entry systems. The bandpass of video amps in most TV sets far surpasses the dot clock frequency of home computers and clear, sharp character/graphics dots can be displayed.

The late model 13 & 19 inch color TV's advertised lately are the lowest priced units seen up to now. They have a number of characteristics, mostly good, that make them ideal for computer/ATV use. First, they all appear to be made in the Sam Sung (which song?) factory as evidenced by the general board layout. The heart of the system is a 42 pin IC. This processes all video, sync, and

color. Following the 4.5 MHz sound IF filter, there can be found a jumper on the PC board, that leads to pin 6 of the IC. Removal of the jumper gives access to network sync, video & color burst at the input end and the to video amp input at pin 6. Connecting two coax's at the jumper holes and terminating them with connectors, mounted on the rear panel offers a convenient way to utilize the set. A small SPST switch at this location between center pins, restores normal operation of the TV.

We now have a fairly good monitor, a demodulator for a ATV repeater, access for the enhancement and re-insertion of sync and an almost complete flying-spot scanner for transmitting transparencies placed over the screen. Resolution in the latter may suffer from screen persistency but using network sync, at both stations, could save enhance resolution.

See the figure elsewhere in this issue.

PUBLISHER'S NOTES

Hawgwild Software has announced that it is going out of business. If you write at once to the address given in ads in previous issues of QZX you might be able to get reduced prices on some ham software.

AA4DL sent in some new sidereal time constants to be used in his satellite orbit calculation program which appeared in the May 1984 issue of QZX. They are

YEAR	CONSTANT
1985	0.27668301
1986	0.27601992
1987	0.27535683
1988	0.27469374
1989	0.27676856
1990	0.276105472
1991	0.275442383
1992	0.274779294

Several have expressed interest in the old RS-232 circuit that appeared in Sync Magazine. Having acquired a few issues of CTM magazine, I noted that the original author of that circuit has updated it. We unfortunately only have part one of the two part article! It was entitled "A Serial Interface Project for the ZX-81 & TS-1000", by Vic Rice, 119 Exeter Road, Ajax, Ontario, Canada L1S 2K4. If you have the second part I would appreciate a copy. I may write the author or CTM to see if we could reprint the articles. We have just recently subscribed to CTM, so we shouldn't lose out on any more issues.

BITS AND BYTES

56. Often, particularly when one is finished with a dimemsioned variable, you want to get rid of it so that the memory space can be used by something else. For example, if you have entered DIM Z(22) and are now though with the Z variable, you may want to delete the Z variable and use the memory space for something else in the program. Of course CLEAR will do this, but it will clear all the variables at once. Instead, you can just put in another DIM statement, DIM Z(0). This statement will only affect the Z variable. Unfortunately it will result in an error message because you cannot DIMension to zero. Fortunately, before the computer gets around to checking for that error, it has already wiped out the old Z and released the memory space once occupied by it. Within a program, you can handle the error with an ON ERR CONTINUE before the DIM statement and an ON ERR RESET after it.

57. It has been suggested that if you order UK tapes for your spectrum converted 2068, that you make a copy immediately upon receipt to be sure they will load. Some will bind inside the case or break off due to binding. Many UK tapes do not have screws to easily access the insides to free the tape or to add lubrication to the rollers. Also some tapes have such a low bias that they do not have adequate volume to load consistantly.

58. Another way to reduce crashes due to connector wobble. Just keep those contacts clean. Use pure Freon (TF sold as "professinal" tape head cleaner at Radio Shack). A good non-silicone contact cleaner such as Cramolin, mixed with the Freon, works well.

QZX FRIENDS

K6CHS -- Don writes that he has just bought a piece of gear for his T/S 1000 called KRADLE. It is really neat, has a full sized keyboard, houses the T/S 1000, has 64K ROM, and a lot more functions which has has not yet figured out because he needs a manual. See the unclassifieds.

OH0NC -- Sam sends along two programs which will be published soon.

UNCLASSIFIED ADS

WANTED: UNCLASSIFIED ADS for publication in QZX. Cost is 1 cent for each keystroke (characters, blanks, etc.). Payment must be included with order. This is an excellent way to sell your program or unwanted equipment, ask for help, or find a specific program. Send your ad with payment to QZX, 2025 O'Donnell, Las Cruces, NM 88001.

FOR SALE: CWSS users! MLI 2.0 permits QSK operation without prompting and can save Rx text for review on the screen or hard copy. Send $12.50 for MLI 2.0 or SASE for info sheet. John McGinley N9BBN/203 Milwaukee St./Mauston, WI 53948

WANTED: Memotext word processor (or equivalent) and memopac I/F centronics type parallel printer interface (or equivalent) for ZX81. Please state price. Don Smith, P.O.Box 578, Hemet, CA 92343

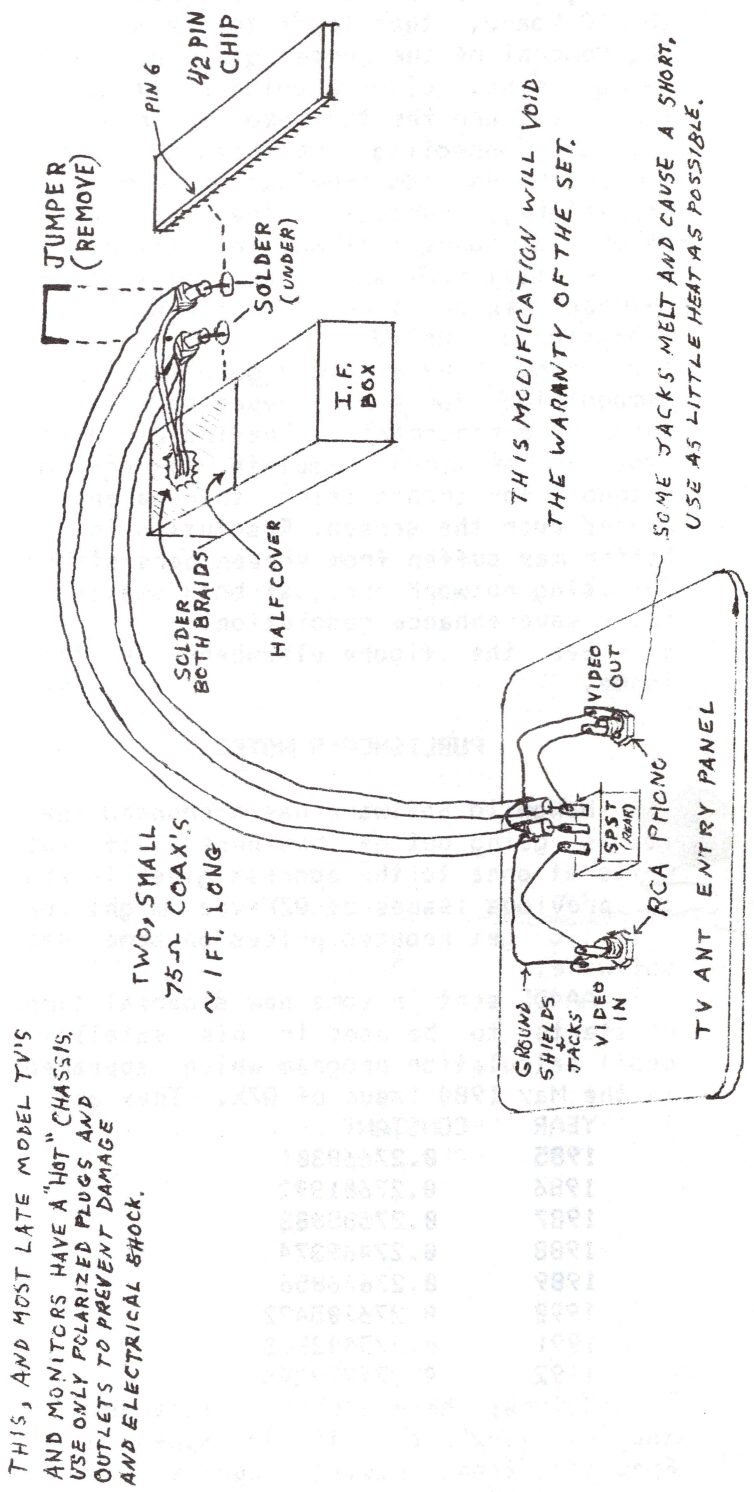
FOR SALE: The world's smallest computer (maybe). Computing power is limited to keeping time and date only. Comes with swivel base, simulated keyboard, built-in power supply, and 1" monitor. All this for only $5 (includes postage). Bo Barry, 1967 Defiance Ave., Las Cruces, NM, 88001.

FOR SALE: "THE COMPLETE SINCLAIR ZX81 BASIC COURSE" published by Melbourne House (Publishers). New price $34.95. In new condition in two ring notebook. $12 postpaid. Alex. F. Burr, K5XY, QZX, 2025 O'Donnell, Las Cruces, NM 88001.

WANTED: Need badly... A manual and any info on a piece of gear called KRADLE for TS1000. Please contact D. Smith P.O. Box 578, Hemet, C343. Please send price. All letters will be answered.

FOR SALE (MAYBE)

Collins 75S3B, 32S3, 516F2 complete ham station (with a spare set of almost all of the tubes). Millen 92200 transmatch. R-390A general coverage receiver with SSB product detector. I'm considering 'going solid-state' due to space limitations, but may not part with my favorites, which all work FINE. MAKE OFFERS to: Bo Barry, W4GHV, 1967 Defiance Ave, Las Cruces, NM, 88001. 505-523-2063.


PIN 6
1/2 PIN CHIP
JUMPER (REMOVE)
SOLDER (UNDER)
I.F. BOX
HALF COVER
SOLDER BOTH BRAIDS
TWO, SMALL 75-Ω COAX'S ~ 1 FT. LONG
THIS MODIFICATION WILL VOID THE WARRANTY OF THE SET.
SOME JACKS MELT AND CAUSE A SHORT, USE AS LITTLE HEAT AS POSSIBLE.
VIDEO OUT
SPST (REAR)
RCA PHONO
GROUND SHIELDS & JACKS
VIDEO IN
TV ANT ENTRY PANEL
THIS, AND MOST LATE MODEL TV'S AND MONITORS HAVE A "HOT" CHASSIS. USE ONLY POLARIZED PLUGS AND OUTLETS TO PREVENT DAMAGE AND ELECTRICAL SHOCK.

Earth-Moon-Earth (EME) Communication

Earth-Moon-Earth (EME) communication, more commonly known as moonbounce, is the next most popular method of space communication after artificial satellites such as OSCAR. In EME, the Moon is used as a reflector or passive relay which makes possible reliable, long range (up to 11,000 miles) communication on VHF and UHF. However, because the Moon is so distant from the Earth (approx. 240,000 mi.), path losses are rather large and received signal-to-noise (S/N) ratios are somewhat low.

Since this is weak-signal work, you must have some fairly sophisticated gear. Generally, a very low-noise receiving system and large antenna arrays (at least 20 dB gain) are required for successful 2-way EME communications. However, even with less than marginal equipment (a simple Yagi, preamplifier, & multimode receiver), you may pick up some of the stronger stations, and start out as a listener.

Transmissions are made on CW or SSB using as close to maximum legal output power as possible. Frequencies used in EME work include 50 MHz, 144, 220, 432, 1296, and 2304 MHz, although 144 MHz and 432 MHz seem to be the most popular. For more detailed information on EME than is possible to give here, you should consult the ARRL HANDBOOK (any year). The EME information may be found in their chapter on Space Communication. Also, according to the ARRL HANDBOOK (1985), an EME net meets on weekends on 14.345 MHz (at 1600 & 1700 UTC). You might want to listen in and see what's going on.

Moonbounce (EME) Program for TS-2068

Of course, for EME work you must accurately aim your antenna at the Moon. This is where my program (listed below) for the Timex/Sinclair 2068 computer, becomes indispensable. The program computes the Moon's (or Sun's) position for any time & date and for any QTH on the globe, which allows accurate positioning of steerable antennas. The program is very easy to use, as it features a built-in lunar (& solar) ephemeris so there is no need to look up values in the Nautical or Astronomical Almanacs. The program is accurate for any date between March 1700 A.D. and Feb. 2200 A.D.

To use this program, you must enter the date (month, day, & year) and your QTH (longitude and latitude, expressed in decimal degrees). West longitudes are entered as positive (+) numbers, and East as (-). For latitudes, use (+) for North or (-) for South. For example, the coordinates of El Paso, TX are: longitude= +106.49, latitude= +31.76 . Note: for the North-Western Hemisphere all such quantities are positive.

Then enter the celestial body (Moon or Sun) that you wish to track. Of course, for EME you will want the Moon. But you may also specify the Sun, which is useful for calibrating your antenna system by peaking the antenna on solar noise. The solar ephemeris is also useful for checking whether the Sun is within 10 degrees of the Moon. If they are too close, such as during a New Moon, EME communication will be impossible because of the increased Sun-noise pickup.

Finally, enter the starting time (UTC) that you wish tracking to begin, and the time increment (in minutes) that you want the successive positions calculated. When entering the start time (UTC), use the format HH.MM, where the hours and minutes are separated by a period (.) . The time increment (minutes) may range from 1 to 100, but 20- 30 minutes or so are usually convenient for EME work.

A sample lunar position chart is shown below, computed for El Paso, Texas on Dec.31, 1985. Here, positions were computed every 60 min. to save space. For each time (UTC) on the left, two sets of coordinates are given on the right. The first set, Greenwich Hour Angle (GHA) and Declination, may be used for positioning your antenna, if you have a polar or equatorial mount antenna system.

Most common, however, is the AZ-EL type mount, for which you would use the second set of coordinates on the chart. Azimuth (Az) is the angle (0 - 360) measured from true North in a clockwise direction (e.g. N= 0, E= 90, S=180, W=270, etc.). Elevation (El) is the angle (0 - 90) measured vertically from the horizon. A negative elevation would indicate that the Moon is below the horizon.

For easy reading, positions below the horizon are output in reverse (dark) print on the table. The remaining white portion of the chart, then, determines your EME "window", i.e. the period of time that your station will "see" the Moon. Also, just by examining the chart, the approximate rise/set times (UT) may be found for the Moon (or Sun).

Imre Auersbacher
41 King Street, A2
Belleville, NJ 07109

Moonbounce (EME) for TS-2068
(c) 1985 I. Auersbacher

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- I.O.

6

```
   2 REM  MoonBounce Calc (EME)
   4 REM  © 1985  I.Auersbacher
   6 DEF FN a(x)=SGN (x)*360*(ABS x/k-INT (ABS x/k)): DEF FN e$(h)=("-" AND h<0)+(" " AND h>=0)
   8 DEF FN b(x)=k*(x/k-INT (x/k)): DEF FN c(x)=INT (10*x+0.5)/10: DEF FN d$(h)=("n" AND h>0)+("s" AND h<0)+(" " AND h=0)
  10 BORDER 5: POKE 23609,10
  12 POKE 23658,8: GO TO 9500
 100 LET h=4.881628+628.331951*t
 110 LET s=4.720009+8399.70927*t
 120 LET n=4.523602-33.7571463*t
 130 LET p=5.8351516+71.018041*t
 140 LET s=FN b(s): LET l=s+0.11*SIN (s-p)+0.022*SIN (s-2*h+p)+0.011*SIN (2*s-2*h)+0.004*SIN (2*s-2*p): LET l=FN b(l)
 150 LET ra=l-0.043*SIN (2*l)+0.019*SIN (n)-0.019*SIN (2*l-n)
 160 LET dec=ASN (0.406*SIN ra+0.008*SIN (3*ra)+0.09*SIN (ra-n)+0.006*SIN (3*ra-n)): RETURN
 200 LET h=4.881628+628.331951*t
 210 LET p=4.908229+3.00025589*t: LET h=FN b(h)
 215 LET l=h+0.034*SIN (h-p)
 220 LET ra=l-0.043*SIN (2*l)
 230 LET dec=ASN (0.406*SIN (ra)+0.008*SIN (3*ra)): RETURN
 300 LET gha=s+2*PI-ra: LET lha=gha-ln*PI/180: LET gha=FN a(gha)
 310 LET n=SIN lat*SIN dec+COS lat*COS dec*COS lha: LET el=ASN n
 320 LET az=ACS ((SIN dec-n*SIN lat)/(COS el*COS lat))
 330 IF b=1 THEN LET el=ATN ((n-0.01657)/COS el)
 340 IF SIN lha>0 THEN LET az=2*PI-az
 350 LET dec=FN a(dec): LET az=FN a(az): LET el=FN a(el)
 360 RETURN
1000 LET k=2*PI: LET d=0.001
1020 LET w=(f*6.5709835e-2+22.5506642 9)/24: LET w=24*(w-INT w)
1040 FOR z=t1 TO 24.00 STEP i
1050 LET t=(f+z/24-72989.5)/36525: GO SUB 100*b
1060 LET s=w+1.00274*(z-12)
1070 IF s<0 THEN LET s=s+24
1080 LET s=k*(s/24-INT (s/24))
1090 GO SUB 300: LET h=INT (z+d): LET m=INT (60*(z-h)+d): LET gha=FN c(gha): LET dec=FN c(dec): LET az=FN c(az): LET el=FN c(el)
1092 LET g1=INT gha: LET g2=INT (10*(gha-g1)+0.5): LET d1=INT (ABS (dec)): LET d2=INT (10*(ABS dec-d1)+0.5): LET z1=INT AZ
1094 LET z2=INT (10*(az-z1)+0.5)
1096 LET e1=INT (ABS (el)): LET e2=INT (10*(ABS (el)-e1)+0.5)
1098 IF el<0 THEN INVERSE 1
2000 PRINT #4;n$(2*h+1 TO 2*h+2);":";n$(2*m+1 TO 2*m+2);TAB 10-LEN STR$ g1;g1;".";g2;TAB 14;n$(2*d1+1 TO 2*d1+2);".";d2;FN d$(dec);TAB 24-LEN STR$ z1;z1;".";z2;TAB 29-LEN STR$ e1;FN e$(el);e1;".";e2: INVERSE 0
2100 NEXT z: GO TO 9800
7000 BORDER 5: PAPER 3: CLS
7150 PRINT PAPER 6;AT 1,3;"┌──────────────────────────┐";AT 2,3;"│ Lunar /Solar Ephemeris │";AT 3,3;"│   for MoonBounce (EME)   │";AT 4,3;"│ © 1985  I. Auersbacher   │";AT 5,3;"└──────────────────────────┘"
7155 PLOT 0,0: DRAW 0,175: DRAW 255,0: DRAW 0,-175: DRAW -255,0
8000 LET n$="000102030405060708091011121314151617181920212223242526272829303132333435363738394041424344454647484950515253545556577585960"
8005 LET d$="Sunday   Monday   Tuesday  WednesdayThursday Friday   Saturday  "
8010 LET m$="Jan.Feb.Mar.Apr.May Jun.Jul.Aug.SeptOct.Nov.Dec.  "
8012 BEEP 0.05,15: INPUT PAPER 7;"Month (1-12): ";m: LET m=INT m: IF m<1 OR m>12 THEN BEEP 0.5,-15: BEEP 0.5,-20: GO TO 8012
8014 PRINT PAPER 7;AT 7,3;"Month:"; PAPER 6;m$(4*m-3 TO 4*m);"  "
8016 BEEP 0.05,15: INPUT PAPER 7;"Day (1-31): ";d: LET d=INT d: IF (d<1)+(d>31) THEN GO TO 8016
8017 PRINT PAPER 7;AT 8,3;"Day:"; PAPER 6;d;"  "
8019 BEEP 0.05,15: INPUT PAPER 7;"Year (YYYY): ";y: LET y=INT y: IF y<100 THEN LET y=y+1900
8020 IF y<1700 OR y>2200 THEN BEEP 1.2,-22: GO TO 8019
8021 PRINT PAPER 7;AT 9,3;"Year:"; PAPER 6;y;"  ": DIM c$(4,12)
8022 PAUSE 30: BEEP 0.05,15: INPUT PAPER 7;"Longitude: "; LINE q$: LET ln=VAL q$: LET c$(1)=q$
8023 IF ln<-180 OR ln>180 THEN BEEP 1.2,-20: GO TO 8022
8024 PRINT PAPER 7;AT 7,16;"Long= "; PAPER 6;c$(1 TO 7)
8025 PAUSE 30: BEEP 0.05,15: INPUT PAPER 7;"Latitude: "; LINE q$: LET lat=VAL q$: LET c$(2)=q$
8027 IF lat<=-90 OR lat>=90 THEN BEEP 1.2,-22: GO TO 8025
8028 LET lat=lat*PI/180
8030 PRINT PAPER 7;AT 8,16;"Lat.= "; PAPER 6;c$(2 TO 7)
8032 BEEP 0.05,15: INPUT PAPER 7;"Enter (1-Moon, 2-Sun):";b: LET b=INT b: IF (b<1)+(b>2) THEN GO TO 8032
8034 LET b$=("Moon" AND b=1)+("Sun " AND b=2): LET c$(3)=b$
8035 PRINT PAPER 7;AT 9,16;"Body: "; PAPER 6;c$(3,1 TO 12)
8036 PAUSE 20: BEEP 0.05,15: INPUT PAPER 7;"Start Time (HH.MM):"; LINE q$: LET t1=VAL q$: IF (t1<0)+(t1>=24) THEN GO TO 8036
8037 PRINT PAPER 7;AT 11,3;"Start:"; PAPER 6;q$: PAUSE 20
8038 BEEP 0.05,15: INPUT PAPER 7;"Time increment (min.):";i: LET i=INT i: IF i<1 OR i>100 THEN BEEP 1.3,-15: GO TO 8038
8039 PRINT PAPER 7;AT 11,16;"Incr=";" ";STR$ i+" min."
8041 PRINT PAPER 6;AT 13,4;"Output to which device?"
8042 PRINT PAPER 7;AT 15,9;"1-TV Screen ";AT 16,9;"2-TS printer"
8043 BEEP 0.05,15: PRINT PAPER 6;AT 18,4;"Please pick option (1-2)": PAUSE 30
8044 LET q$=INKEY$: IF q$="" THEN GO TO 8044
8045 LET q=CODE q$-48: IF (q<1)+(q>2) THEN BEEP 0.5,-15: BEEP 0.6,-20: GO TO 8044
8046 BEEP .05,22: PRINT INK 0;AT 14+q,6;CHR$ 144; INK 6;CHR$ 145
8048 PAUSE 50: IF q=1 THEN OPEN #4,"s": PAPER 7: CLS : GO TO 8052
8050 OPEN #4,"p": PRINT FLASH 1; PAPER 7;AT 20,4;" See printer for output "
8052 PRINT #4;"AZ-EL Table for Moonbounce (EME)": PRINT #4
8054 LET f=INT (30.6*(m+1+12*(m<=2)))+INT (365.25*(y-(m<=2)))+d-621049: LET h=f-(7*INT (f/7))+1
8060 PRINT #4;"Body:Tracking ";b$;" from QTH of"
8062 PRINT #4;"Long:";c$(1 TO 9);TAB 14;"Lat.:";c$(2 TO 9)
8064 PRINT #4;"Date: ";m$(4*m-3 TO 4*m);" ";d;", ";y;"  ";d$(9*h-8 TO 9*h)
8070 PRINT #4;"Note: all times are UTC (GMT)": PRINT #4
8080 PRINT #4;"Time   GHA   DEC.   AZ   EL": PRINT #4;"                              "
8100 LET t1=INT t1+100*(t1-INT t1)/60: LET i=i/60: GO TO 1000
9500 BEEP 0.05,22: BEEP 0.05,20
9510 RESTORE 9700: FOR h=0 TO 7: READ t,f: POKE USR "a"+h,t: POKE USR "b"+h,f: NEXT h: POKE 23609,10: POKE 23658,8: GO TO 7000
9700 DATA 0,24,0,48,127,96,127,255,127,255,115,248,115,248,127,240
9800 PRINT #4: PRINT #4: BEEP 0.05,22: BEEP 0.05,22: PRINT #0; PAPER 7;" Another chart (Y/N) "
9810 LET q$=INKEY$: IF q$="" THEN GO TO 9810
9820 IF q$="Y" THEN BEEP 0.05,20: BEEP 0.05,19: RUN 7000
9850 PAPER 7: CLS : BORDER 7: PRINT FLASH 1;AT 10,6;" Program Terminated ": GO TO 9999
9900 SAVE "eme" LINE 9500
```

```
 Lunar /Solar Ephemeris
   for MoonBounce (EME)
 © 1985  I. Auersbacher

Month:Dec.     Long= 106.49
Day  :31       Lat.= +31.76
Year :1985     Body: Moon

Start:00.00   Incr= 60 min.

 Output to which device?

     1-TV Screen
  ☛ 2-TS printer

 Please pick option (1-2)

  See printer for output
```

```
AZ-EL Table for Moonbounce (EME)

Body:Tracking Moon from QTH of
Long:106.49    Lat.:+31.76
Date: Dec. 31, 1985  Tuesday
Note: all times are UTC (GMT)

Time    GHA    DECL.    AZ     EL
00:00   313.4   18.9n    30.8  -33.9
01:00   327.9   18.7n    44.1  -26.8
02:00   342.4   18.5n    55.1  -17.4
03:00   357.0   18.3n    64.1   -7.0
04:00    11.5   18.1n    72.0    4.4
05:00    26.0   17.9n    79.2   16.2
06:00    40.5   17.7n    86.4   28.5
07:00    55.0   17.5n    94.4   40.8
08:00    69.5   17.3n   104.6   53.0
09:00    84.0   17.1n   120.6   64.5
10:00    98.5   16.8n   152.4   73.2
11:00   113.1   16.6n   203.0   73.6
12:00   127.6   16.4n   236.2   65.1
13:00   142.1   16.2n   252.7   53.6
14:00   156.6   16.0n   263.0   41.3
15:00   171.1   15.8n   270.9   28.7
16:00   185.6   15.5n   278.0   16.3
17:00   200.2   15.3n   285.0    4.0
18:00   214.7   15.1n   292.5   -7.9
19:00   229.2   14.9n   301.2  -18.9
20:00   243.7   14.7n   311.9  -28.9
21:00   258.3   14.4n   326.3  -37.9
22:00   272.8   14.2n   341.9  -42.9
23:00   287.3   14.0n     1.1  -44.9
24:00   301.8   13.7n    20.3  -42.9
```

2068 TO SPECTRUM CROSS-REFERENCE

by H. E. Weppler

This article reprinted from C.A.T.S., the Captiol Area Timex/Sinclair Users Group September 1985 issue will be useful to those who have purchased a ROM to allow their T/S 2068 to emulate a Spectrum. It will also help those who are trying to get programs to run on the other type of computer.

I find it particularly interesting and useful to call the routines stored in the ROM. There is some information on this in the 2068 technical manual, but the most useful source is Logan and O'Hara's book on the Spectrum ROM disassembly.

Of course Logan/O'Hara cannot be used directly, because the memory references only apply to the Spectrum. Consequently, I have prepared the attached "ROM Index." This provides direct reference from most of the routines mentioned in the Technical Manual to the Spectrum routines.

I find the index useful in two ways: First, if I wish to learn more about the contents or use of a routine listed in the Technical Manual, I can look up the corresponding routine in Logan/O'Hara. In many cases the routines are slightly different, because the jumps and calls are to different memory locations. In some cases there are other differences, but in each case the intended use seems to be the same.

Second, if I find a routine in Logan/O'Hara which looks useful, I can usually find it in the 2068 by interpolating in the index. For example, if I wish to use the routine called "GO_TO_2" at 1E73h in Logan/O'Hara, I find in the index "JUMP" and "FIX_U1" which are below and above the desired location. By interpolation I conclude that the routine must be at or near 7933h in the 2068.

While I cannot attend your machine code class, I am attaching the index with the hope that it may be useful to some of those in the class.

ROM INDEX

2068			SPECTRUM
HEX	DEC	NAME	HEX
0000	0	PLUGIN	0000
0010	16	URCH	0010
004F	79	PHLAF	004F
0055	85	LE3	0055
0074	116	NEXTCH	0074
0077	119	NC_HL	0077
0078	120	TC_HL	0078
0098	152	TOKENS	0095
0227	551	KSCAN	0205
02B0	688	K_SCAN	028E
02E1	737	UPD_K	02BF
035C	860	K_BASE	031E
0371	881	CHCODE	0333
03F3	1011	PARP	03B5
0436	1078	BEEP	03F8
0500	1280	SENDTV	09F4
053A	1338	P_LFT	0A23
0554	1364	P_RT	0A3D
0566	1382	P_NL	0A4F
05B2	1458	SET_AT	0A9B
05F3	1523	STTVCU	0ADC
061A	1562	LDTVCU	0B03
0710	1808	ATTBYT	0BDB
073F	1855	PUTMES	0C0A
0776	1910	PR_TV2	0C3B
0790	1936	TVFUL?	0C55
07C1	1985	ERR5	0C86
0888	2184	R_ATTS	0D4D
08A6	2214	K_CLS	0D6B
08A9	2217	CLLHS	0D6E
08EA	2282	CLS	0DAF
0914	2324	SETCUR	0DD9
0914	2324	SETTVC	0DD9
0939	2361	SCRL	0DFE
097F	2431	CLS_B	0E44
0A02	2562	K_DUMP	0EAC
0A23	2595	DUMPPR	0ECD
0A35	2613	CLPR	0EDF
0A4A	2634	PRSCAN	0EF4
0A82	2690	EDIT_K	0F2C
0AE7	2791	INSA	0F81
0B7E	2942	DELSYM	1016
0BFD	3069	DEL_K	1097
0C0E	3086	IN_K	10A8
0C83	3203	ECHO	111D
0D0D	3341	DESLUG	11A7
0D1D	3357	K_NEW	11B7
0D31	3377	INIT	11CB
0D82	3458	NEW	1219
0E2F	3631	LED18	12A9
0E8D	3725	LED4	1303
11AA	4522	CHINIT	15AF
11C1	4545	SMINIT	15C6
11CF	4559	RDCH	15D4
11E1	4577	INCH	15E6
11EA	4586	PUTDIG	15EF
11ED	4589	SENDCH	15F2
1230	4656	SELECT	1601
123D	4669	ERRO	160E
1248	4680	SEL_HL	1615
12B8	4792	INS1	1652
12BB	4795	INSERT	1655
12CA	4810	REMGSZ	1664
1324	4900	GET_LN	1695
132D	4909	LCU2	169E
133F	4927	CLEL	16B0
134E	4942	X_CALC	16BF
1354	4948	RESET	16C5
1363	4963	X_T_HL	16D4
1368	4971	SEARCH	16DC
139F	5023	CLOSE	16E5
13A8	5032	RSTSTR	16EE
13BE	5054	CLCHAN	1701
142A	5162	OPEN	1736
1465	5221	OPCHAN	175D
14E1	5345	LIST	1795
1541	5441	K_LLST	17F5
1545	5445	K_LIST	17F9
15A1	5537	PUT_SR	1855
15AC	5548	LPO	1860
15C9	5577	PUT	187D
160D	5645	FLASHA	18C1
162D	5677	PR_CUR	18E1
165B	5723	NEXT_L	190F
1668	5736	DE_HL	191C
16D6	5846	FIND_L	196E
16E8	5864	CP_BC	1980
16F0	5872	SUBLIN	1988
16F3	5875	SUBLN1	1988
1720	5920	RECLEN	1988
174D	5965	DEL_DE	19E5
1750	5968	DELREC	19E8

1768	5992	LINENO	19FB
1788	6024	PUT_BC	1A1B
1795	6037	PUT_LN	1A28
1945	6469	SYNTAX	1A48
19E0	6624	TEMP38	1ADF
19E1	6625	TEMP39	1AE0
1A27	6695	SYNTAx	1B17
1A44	6724	LS4	1B28
1AB9	6841	ENDSTT	1B76
1AD8	6872	EXCUTE	1B8A
1B44	6980	END?	1BEE
1B4A	6986	ENDTEM	1BF4
1B82	7042	TEM1	1C1F
1B91	7057	ERR2	1C2E
1BBC	7100	LT22	1C59
1BDC	7132	DYADIC	1C79
1BE5	7141	TEM6	1C82
1BED	7149	SYNERR	1C8A
1BEF	7151	TEM10	1C8C
1C49	7241	OPTNO	1CDE
1C51	7249	STK_O	1CE6
1C59	7257	STOP	1CEE
1C78	7288	FOR	1D03
1D28	7464	SKIP	1D86
1D55	7509	NEXT	1DAB
1D97	7575	READ	1DED
1E82	7810	DATA	1E27
1ECA	7882	RESTBC	1E45
1ED4	7892	RAND	1E4F
1EE4	7908	CONT	1E5F
1EF1	7921	JUMP	1E67
1F1E	7966	FIX_U1	1E94
1F23	7971	FIX_U	1E99
1F29	7977	ERRB	1E9F
1F36	7990	CLEAR	1EAC
1F39	7993	CLR_BC	1EAF
1F99	8089	GO_SUB	1EED
1FBB	8123	CHK_SZ	1F05
1FCF	8143	ERR4	1F15
1FD4	8148	RETURN	1F23
1FEB	8171	PAUSE	1F3A
2009	8201	BREAK?	1F54
201D	8221	DEF	1F60
214F	8527	SYNTUO	1FC3
2155	8533	K_LPR	1FC9
2159	8537	K_PRIN	1FCD
217F	8574	P_SEQ	1FDF
21E7	8679	TERM?	2048
220F	8719	STRITO	2070
222B	8747	INPUT	208E
226B	8811	I_SEQ	20C1
237E	9086	ERRH	21D4
2380	9088	NOTKB?	21D6
238C	9100	GR_COL	21E2
23A6	9126	COLITM	21FC
23BB	9147	TV_COL	2211
23DE	9182	COLOUR	2234
241D	9245	HIFLSH	2273
243E	9278	BORDER	2294
2603	9731	SCRMBL	22AA
2624	9764	F_PNT	22CB
2635	9781	PLOT	22DC
263E	9790	PLOTBC	22E5
2660	9824	GET_XY	2307
2679	9849	CIRCLE	2320
26DB	9947	DRAU	2382
2810	10256	DRAU_L	24B7
2813	10259	DRAULN	24BA
2854	10324	EXPRN	24FB
2889	10377	INTPT?	2530
288E	10382	F_SCRN	2535
28D7	10455	F_ATTR	2580
29B6	10678	RND	25F8
29E5	10725	F_PI	2627
29F2	10738	F_INKY	2634
2C69	11369	NXT_HL	28AB
2C70	11376	FIND_N	28B2
2D54	11604	GET_EL	2996
2E10	11792	SLICER	2A52
2E70	11888	PSHSTR	2AB2
2E74	11892	PAEDCB	2AB6
2E8D	11965	LET	2AFF
2FAF	12207	POPSTR	2BF1
2FC0	12224	DIM	2C02
3046	12358	ALNUM?	2C88
3048	12363	ALPHA?	2C8D
3059	12377	STKUSN	2C9B
30D9	12505	DIGIT?	2D1B
30E6	12518	STK_A	2D28
30E9	12521	STK_BC	2D2B
30F9	12537	ININT	2D3B
310D	12557	XEY	2D4F
313D	12605	LDDE	2D7F
314A	12618	STDE_U	2D8C
314C	12620	STDE_S	2D8E
3160	12640	FP2BC	2DA2
3193	12691	FP2A	2DD5
31A1	12705	OUTPUT	2DE3
335A	13146	SUMS	2F9B
3379	13177	SUMSLD	2FBA
339C	13212	SHIFT	2FDD
33CE	13262	SUB	300F
33D3	13267	ADD	3014
3468	13416	MULT	30A9
3489	13449	TIMES	30CA
356C	13676	ERR6	31AD
356E	13678	DIVIDE	31AF
35D3	13779	TRUNC	3214
3656	13910	FLOAT	3297
3684	13956	CALC	3254
371A	14106	CTRO	335B
3768	14184	ROOM?	33A9
3773	14195	STK_M	33B4
377F	14207	RAMNO	33C0
37C5	14277	ARRAY	3406
382D	14381	NEGATE	346E
3904	14596	TESTO	34E9
3926	14630	STBOOL	350B
3ABB	15035	INTDIV	36A0
3ACA	15050	INT	36AF
3ADF	15071	EXP	36C4
3B2E	15150	LN	3713
3B9E	15262	ANGLE	3783
3BC5	15301	COS	37AA
3BD0	15312	SIN	37B5
3BF5	15349	TAN	37DA
3BFD	15357	ATN	37E2
3C4E	15438	ASN	3833
3C5E	15454	ACS	3843
3C65	15461	ROOT	384A
3C6C	15468	TO_THE	3851
3C89	15497	SEPRMT	09A1
3CA8	15528	LDMES	09C1

OF INTEREST BUT NOT LISTED IN 2068 TECH MANUAL:

0F65	3941	RPTMSG	1391
1EFD	7933	GOTO_2	1E73
266D	9837	GET_A	2314
2F17	12055	L_NUM	2B59

EXROM:

0068x	104x	U_TAPE	04C2
00E5x	229x	U_BORD	053F
00FCx	252x	R_TAPE	0556
0189x	393x	RD_BIT	05E3
018Dx	397x	R_EDGE	05E7
01ABx	427x	SLUM	0605
05CCx	1484x	LOAD	0808
06E5x	1765x	MERGE	08B6
0851x	2129x	SAVE	0970

H.E.UEPPLER

Thanks to Edward & Tony for using Bold print on their 2040's!

MF 9

Here is a useful article reprinted from the Sinc-Linc, the newsletter of the Toronto Timex-Sinclair Users Club (July-August 1985 issue). It will help those who are trying to interface printers for RTTY. It will also provide some ideas on output decoding for other uses too.

The 2040 Printer Interface

a short lesson in I/O port decoding
by Cameron Hayne

Inside the funny shaped black box at the end of the printer cable, the one you plug into your computer, is a circuit board with a capacitor, two ferrite rods and a chip. The purpose of the capacitor and the rodsis to reduce the effects of electronic noise. The purpose of the chip, a 74LS10N triple 3-input NAND gate, is to deliver a "pay attention" signal to the printer to tell it when the computer is talking to it.

Most of the signals from the computer edge connector are not used by the 2040 printer but pass straight through the black box to be available for other, more demanding periferals such as memory expansion.

The connections and logic diagram for the chip is shown in Figure 1.

A NAND gate has an output voltage close to 5 volts (high) except if all of itsinputs are at 5 volts. In the latter unanimous case the output voltage drops to near zero volts (low). Thus we see the black wire will usually be at 5 volts. Working backwards, from right to left, we see that the only way the black wire will go low is if simultaneously A7 is high and both A2 and $\overline{IORQ}$ are low.

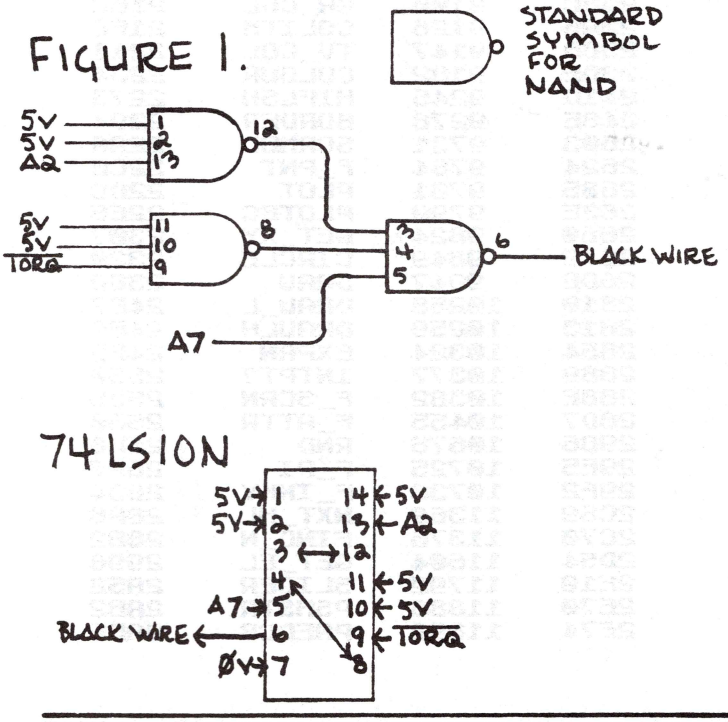
$\overline{IORQ}$, which stands for input/output request, will only go low when the computer does an IN or an OUT instruction. The port number attached to the IN or OUT instruction goes onto the address bus, thus determining the voltage of signals A2 and A7. High corresponds to the bit being =1, low to the bit =0. What this all means in the case of the 2040 printer is thatt the printer will respond to any port number that has bit #7 =1 and bit #2 =0. Port number = 1????0? in binary, where the question marks can be either zero or one.

The Timex-Sinclair designated port is 251 (FB Hexadecimal) which does indeed have bit #7 =1 and bit #2 =0. But the printer will respond to 63 other port numbers as well - not a very desireable situation since other periferals may try to use those ports. This is referred to as incomplete decoding of the port address. A similar problem causes the difficulties in expanding the ZX81 to 64K.

Refering back to Figure 1, the stuff to be printed is passed out to the printer, one bit at a time, along line D7. The other data lines are used for control od the printer. The $\overline{RD}$ and $\overline{WR}$ signals are used by circuitry within the printer to tell it whether it is supposed to be printing sttuff or whether it is to being asked for a progress report.

As an additional note on oort addressing, Wes Brzozowski has pointed out in SINCUS NEWS, April'85, that the decoding logic for an I/O port should check that M1 is "high" so that the periferal is not accidentally activated during an interrupt. This lack has caused some software using interrupt mode 2 to crash when certain periferals were connected.

FIGURE 1.



BANK SWITCHING OPERATING SYSTEM FOR THE ZX81/TS1000

*** USE THE 48 TO 64K BLOCK OF MEMORY FOR BASIC PROGRAMS ***

*** CREATE A "VIRTUAL MEMORY" SYSTEM ***

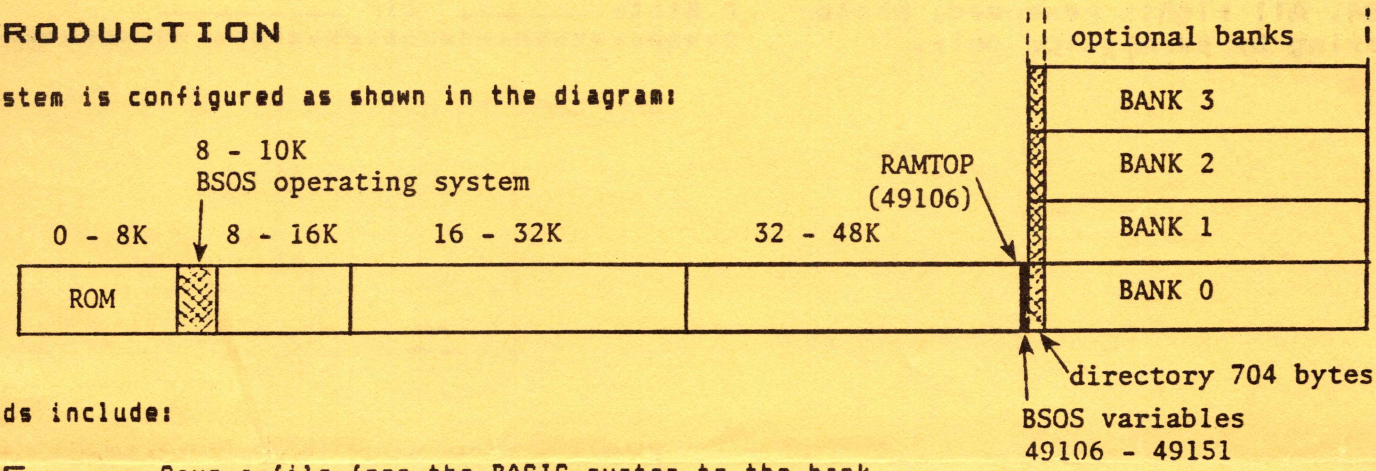
*** AS DESCRIBED IN T S HORIZONS (March 1984 through March 1985) ***

*** USE WITH A 64K RAM PACK ***

*** OR BUILD A BANK-SWITCHED SYSTEM WITH LIMITLESS MEMORY ***

INTRODUCTION

The system is configured as shown in the diagram:



Commands include:

SAVE	Save a file from the BASIC system to the bank
LOAD	Load a file back from the bank into the BASIC system
PURGE	Purge a file from the bank
RECLAIM	Clear variables or a program (or part) from the BASIC system
PACK	Repack the contents of the bank
BANK	Change from one bank to another
ROOM	Determine space available in a bank
QUIT	Return to Sinclair BASIC system

A sample directory listing the contents of a bank is shown on the right. Files may be programs, subroutines, display files, variables, or a "total system". Some of the routines in BSOS can be called from within a BASIC program to create a virtual memory system -- so you can run a program larger than 16K or manipulate a huge data file. A virtual system allows the program to modify itself while it is running.

The program on the tape will transfer the operating system to the 8 - 10K block; reset RAMTOP to 49106; and load the directory shown on the right. The cassette tape with instructions and a memory map of all routines is available for $10 ppd from:

```
BANK 1 DIRECTORY
================================
NO.   NAME     .EXT  ADDR  SIZE
---   ----     ----  ----  ----
A: DIRECTORY  .DIR:49152:00704:
B: SAVEROUTINE.PRG:49856:00134:
C: DEC-TO-HEX .PRG:49990:00308:
D: HEX-TO-DEC .PRG:50298:00134:
E: CONVERSION .PRG:50432:00750:
F:
G:
H:
I:
J:
K:
L:
M:
N:
O:
================================
1:SAVE  3:PURGE   5:PACK  7:ROOM
2:LOAD  4:RECLAIM 6:BANK  8:QUIT
```

HUNTER
1630 FOREST HILLS DRIVE
OKEMOS, MICHIGAN 48864

73, W4GHV & K5XY

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```
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* Call _____________                    *
*                                       *
* Address __________________________    *
*                                       *
* City _____________________________    *
*                                       *
* State _______  ZIP __________         *
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